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Abstract

SOME STUDIES CONCERNING STRUCTURE, RADIATION DAMAGE ANNEALING AND FISSION PRODUCT DIFFUSION IN PYROLYTIC CARBON

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A number of studies on pyrolytic carbon were performed in order to contribute to the general understanding of this material.

Its structure was characterized mainly by neutron diffraction; data on preferred orientation, porosity, layer order, and crystallite dimensions, perpendicular and parallel to deposition planes, were obtained. The specific advantages of neutron diffraction methods against the corresponding X-ray techniques are discussed.

The investigated materials include various pyrolytic carbon samples which have been treated at different temperatures ($2000^{\circ}C$ - $3000^{\circ}C$) after deposition and also a sample of amorphous cellulose carbon.

The samples, previously characterized by diffraction methods, were irradiated at $78^{\circ}K$ up to fast neutron doses ($E>1$ MeV) of 10^{18} cm^{-2}. Subsequent recovery of electrical resistivity and structural parameters was carried out in order to identify annealing stages and to interpret the recovery process.

In other samples, having the same characteristics, the diffusion of some fission products (Zr, Nb, Xe, Cs, Ba) has been studied, by measuring both the diffusion coefficients and the probabilities of evaporation from the surface.

In the experimental procedure fission fragments are injected into the sample by fission recoil from a thin uranium foil and their distribution and the escaped fraction after heating at high temperature are measured.

The influence of the diffusion and evaporation processes on the loss of the above elements is discussed.